

The deal.II library: supporting adaptivity and other modern finite element trends

W. Bangerth

Texas Institute for Computational and Applied Mathematics
The University of Texas at Austin
ACE 5.318
Austin, TX 78712, USA
bangerth@ticam.utexas.edu

Writing state-of-the-art finite element software tends to become increasingly complex. Techniques like adaptive meshes, error estimation, multigrid methods, or hp finite elements require the programmer to work with extremely complicated data structures and sophisticated algorithms. Designing programs in a maintainable and expandable way while retaining efficiency has therefore become a major task in applied numerical analysis. In our experience, this task can only be fulfilled by using modern programming languages and tools.

In the presentation, we will give an overview of the deal.II finite element library we are developing to satisfy the needs mentioned above. Some applications that are presently being developed on top of the library will be presented, and we will show how modern aspects of the C++ programming language, in particular templates, can be used to write algorithms for finite element programs in a way that is independent from the space dimension. We will also give indications as to future directions of development.

References

Wolfgang Bangerth and Guido Kanschat, “Concepts for object-oriented finite element software – the deal.II library,” Preprint 99-43, SFB 359, Universität Heidelberg, October 1999.

Wolfgang Bangerth, Ralf Hartmann, and Guido Kanschat. “deal.II Differential Equations Analysis Library, Technical Reference,” IWR, Universität Heidelberg, 2003.

<http://www.dealii.org>.

Wolfgang Bangerth, “Using modern features of C++ for adaptive finite element methods: Dimension-independent programming in deal.II,” in Michel Deville and Robert Owens, editors, *Proceedings of the 16th IMACS World Congress 2000, Lausanne, Switzerland, 2000*. IMACS – Department of Computer Science, Rutgers University, New Brunswick, 2000. Document Sessions/118-1.